FEDERAL MARINE TERMINAL SITE

ENVIRONMENTAL STUDY GROUP

STATEMENT OF FINDINGS AND RECOMMENDATIONS

APRIL 1980

U.S. ARMY CORPS OF ENGINEERS - DETROIT DISTRICT

MICHIGAN DEPARTMENT OF NATURAL RESOURCES

On 6 August 1979 the Detroit District Engineer approved a permit which authorized the Federal Marine Terminal Inc. (FMT) to construct a marine facility in Riverview, Michigan. The facility construction would include extensive dredging and filling in the Detroit River.

On 5 November 1979, Corps of Engineers construction inspectors while performing a routine inspection of the authorized project, noted that the surface water and sub-surface soils were of a character that warranted investigation. Further inspection of the site revealed that stainless steel drums, bottles and other containers had been unearthed at the site, thus suggesting a hazardous condition. Michigan Department of Natural Resources (MDNR) and the U.S. Environmental Protection Agency (U.S. EPA) were notified and these agencies commenced site sampling, while the Corps of Engineers monitored all sampling.

A review of the regional geology, the data found in various documents in the permit file, and inspection of the site indicates that approximately 10-15 ft. of fill covers the original land surface. The native sandy soil and swamp materials overlay a regional lake bed clay approximately 60 ft. thick, which rests on bedrock. In places, some gravel is present between the clay and bedrock. Bedrock is a weathered, fractured limestone and/or dolomite and has sufficient permeability to serve as an aquifer. The fill material is composed of sandy, silty clay and industrial waste of many types. The fill is not homogeneous; the different materials appear to have been dumped at random over the years in different places.

Water samples from the site verify the lack of homogeneity. Closely spaced samples often had quite different analyses. While the samples do not present a clear picture of the contamination, they do confirm that heavy metals and organic pollutants are present in substantial amounts.

A report by Dames and Moore, a consulting firm retained by BASF Wyandotte, presents an assessment of groundwater conditions on site. They conclude that groundwater moves across the site from west to east and into the Detroit River. Their test results indicate that the fill is relatively impermeable and they calculated the seepage rate to the river as 1.5×10^{-5} cms.

However, visual inspection of test pits dug during a later study found evidence of many permeability channels within the inhomogeneous fill. The nature of flow into these pits gave the impression of some relatively free flow occurring in the fill. The site is not sealed from the river in any known way, and construction activities at the site may have promoted increased seepage to the Detroit River.

At the recommendation of the General Regulatory Branch, the Detroit District Engineer approved the formation of an interdisciplinary study team to evaluate the possible/probable environmental problems associated with the site construction. The primary objectives of the study group were to:

2. Determine protective measures necessary to maintain environmental quality should the site be abandoned.

3. Identify alternatives for long range solution of the containment and/or disposal of the contaminated materials.

II. METHODS OF STUDY

The interdisciplinary study team was comprised of individuals from both the Corps of Engineers and the Michigan Department of Natural Resources (MDNR), possessing expertise in biology, environmental chemistry, geology, and hydrology.

Evaluation of the known and potential environmental problems associated with the site was accomplished primarily by reviewing existing environmental reports, soil, sediment and water analyses, aerial photographs and other data gathered prior and subsequent to the start-up of construction and the discovery of the hazardous substance problem at the site. Individual review of materials was accomplished by group members, with group discussions taking place on 27 March and 2 April 1980, at Corps and MDNR offices, respectively.

III. DISCUSSION

Review and analysis of the various study results conducted on the FMT site has conclusively demonstrated that subsurface and surface water quality at the site is extremely poor as a result of the disposal of hazardous substances at the site. This is further supported by the most recent investigation of subsurface water quality conducted by Applied Enviornmental Research in February 1980, under contract to FMT.

Table 1 provides a summary of the subsurface water chemistry at the FMT site with a comparison with existing wastewater and drinking water criteria, along with criteria which affords protection to aquatic life. In addition, an analysis of water samples for organic chemicals at the site has revealed the presence of 30 organic chemicals on the U.S. EPA's list of Priority Pollutants. Table 2 provides a summary of organic chemicals detected at the FMT site including a comparison with the U.S. EPA criteria. In addition to those priority pollutants noted in Table 2, polyglycolethers (polyols) were observed to constitute the major portion of the sample taken from the north ditch, while high levels of PCB's (40 mg/l) were also detected in groundwater samples collected at the site (Applied Environmental Research, 9 November 1979).

The movement of groundwater at the site is not well defined. Input of water to the site could be from infiltration of precipitation, inflow of groundwater from adjacent areas, or vertical leakage from the bedrock. The bedrock is known to be artesian, although the actual level of the piezometric surface is not known. Test borings into bedrock from an early study were not properly plugged and may allow vertical leakage out of or into the fill.

a gradient does exist [illegible]
adjoining surface wate[illegible] While the presence of contaminated groundwater on the site does not prove that it is polluting the river, it is logical to assume that it is seeping into the river. The high water table on site appears to be somewhat anamolous, and investigation of the possible sources is warranted.

The apparent slow rate of seepage of contaminated groundwater into the Detroit River and the high rate of dilution at the land-water interface precludes the direct detection and/or measurement of contaminants entering the Detroit River. There is data that shows higher levels of some contaminants in sediments downstream of the site than upstream. However, there are a variety of uncontrolled factors that may influence this result.

In particular, a significant amount of mercury is found in sediments immediately downstream of the FMT bulkhead. It was not detected upstream at the Firestone Plant site. The situation is illustrated in Table 3. An area of fill where water samples also show high levels of mercury is outlined in Figure 1. The relationship between these occurrences of mercury is suggestive, although the actual mechanism and chemistry involved is not established.

A review of the unfinished shoreline as it relates to potential hydrological, erosional and sedimentation problems was examined by the study group. This review disclosed that the partial construction of the bulkhead at the shoreline does not appear to have significantly altered flow characteristics along the shoreline or accelerated the erosional processes at the site. However, the exposed land-water interface represents a continued source of contaminated fill material into the Detroit River. During a site inspection by study group members on 27 March 1980, contaminated surface waters were observed running off the northeast corner of the site into a storm sewer adjacent to the Detroit River.

IV. CONCLUSIONS

It is the opinion of the members of this study group that efforts are warranted to eliminate the continued introduction of highly toxic materials into the Detroit River, via groundwater seepage, overland runoff, and shoreline erosion from the FMT site. It is felt that the construction of an impermeable seal between the contaminated materials and the Detroit River offers the best interim solution to restrict/retard the movement of toxic materials into the Detroit River.

As an interim containment measure construction of a clay bentonite trench around the FMT site, as originally proposed by the Corps and approved by MDNR, will decrease the transport of toxic materials into the Detroit River for a yet undefined time . However, the actual effectiveness of the trench cannot be determined until the characteristics of groundwater movement at the site are more definitely known. It is realized that this containment measure may not be the long-term solution to the problem and that placement of the bentonite trench may aggravate the associated problems of surface ponding and runoff. Resolution of the overall problem remains contingent on the chemical character of the leachate, the source of groundwater recharge, and the ultimate usage of the site.

the underlying clay and constructing it as a wide, compacted clay fill to grade and capping of the site with a combination of roadways, parking lots and warehouses. However, such a decision is contingent of FMT continuing construction on the site. Should the site be abandoned, construction of the clay bentonite trench is still deemed necessary as an interim solution.

Excavation of the entire fill covering the site and its removal to a hazardous waste landfill would be a more ultimate solution. This would involve transport of saturated materials and require containment of the water drainage during transport. Also, the site would probably require dewatering during excavation, and this water would require treatment before discharge to meet the effluent standards set by MDNR Water Quality Division. The disposition of the old survey borings, especially those reaching bedrock, may be critical if they are found to be leaking and recharging the groundwater on site. Also, if contaminants are shown to have penetrated the underlying clay, excavation below the original land surface may be required. This could extend to below river level. Another consideration to be explored by groundwater mapping is the present groundwater flow into the site to determine what conditions would be encountered during excavation.

V. RECOMMENDATIONS

Based on overall considerations given to the site it is recommended that:

1. Construction of the originally proposed bentonite trench be accomplished should the site be abandoned. Collected contaminated water must meet MDNR water quality effluent limitations before discharge.

2. Consideration be given to the feasibility of incorporating both the bentonite trench and the clay roadway foundation (proposed by FMT) to accomplish the desired degree of containment. This alternative should be considered if construction is continued on the site.

3. The feasibility of disposing the material off-site at an approved hazardous waste site in accordance with Act 64 be evaluated as a long-term solution if it is determined that on-site containment represents only a temporary measure.

4. The contaminated bank material be stabilized (i.e., rip-rapped and isolated from the river) should the site be abandoned. In addition, a small dike should be constructed around the northeast corner of the site to temporarily contain the run-off of contaminated surface water.

5. The inter-relationship of waters in the river, the fill, and the bedrock be determined in order to properly assess both the usefulness of the clay bentonite trench, and any long-term solution. This would require a bedrock observation well on-site. Drilling should also include a program of vertically

upon completion. The drilling and sampling method must be designed to insure against cross contamination. A proposed work plan including detailed drilling and sampling procedures should be submitted to the DNR for review and approval before any work is done at this site. In addition it is recommended that a qualified experienced groundwater consultant be retained to design and direct all work relating to the hydrogeology at the site.

The information gathered from such a program would assist in assessing the long-term effectiveness of the containment wall, and also determine if there are unknown hydrogeologic characteristics of the site that would affect foundations or other structures to be built.

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